Forest Research Notes

Northeastern Forest Experiment Station

FOREST SERVICE, U.S. DEPT. OF AGRICULTURE, 102 MOTORS AVENUE, UPPER DARBY, PA.

No. 121
1961

# RESULTS OF DEER EXCLOSURE STUDIES IN NORTHEASTERN PENNSYLVANIA

To demonstrate how deer browsing affects natural tree seedling and sprout reproduction, two groups of deer exclosures were established in the Pocono Mountains of northeastern Pennsylvania. Study of these exclosures after seven growing seasons confirms what other studies elsewhere have found: that when deer are too numerous for their natural food supply, it is impossible to achieve a balanced multiple use of forest land for both timber production and wildlife habitat.

## The Installations

Strips through young oak-maple stands had been clear-cut, except for an occasional oak left for mast, by the State Game Commission in February 1953. The purpose was to provide deer browse: felled trees were not completely severed, but were left hinged to the stumps to prolong life in the crowns for browsing.

The exclosures were built about 3 months later in these clear-cut strips. Bulky slash was removed to facilitate the fencing job and the later examinations for seedlings. Each of the two groups of exclosures consisted of three 1/40-acre square plots--two contiguous ones surrounded by 8-foot fence and one open check plot. The check plots were located 10 or more feet from the other plots so as not to be affected by deer trailing around the fences.

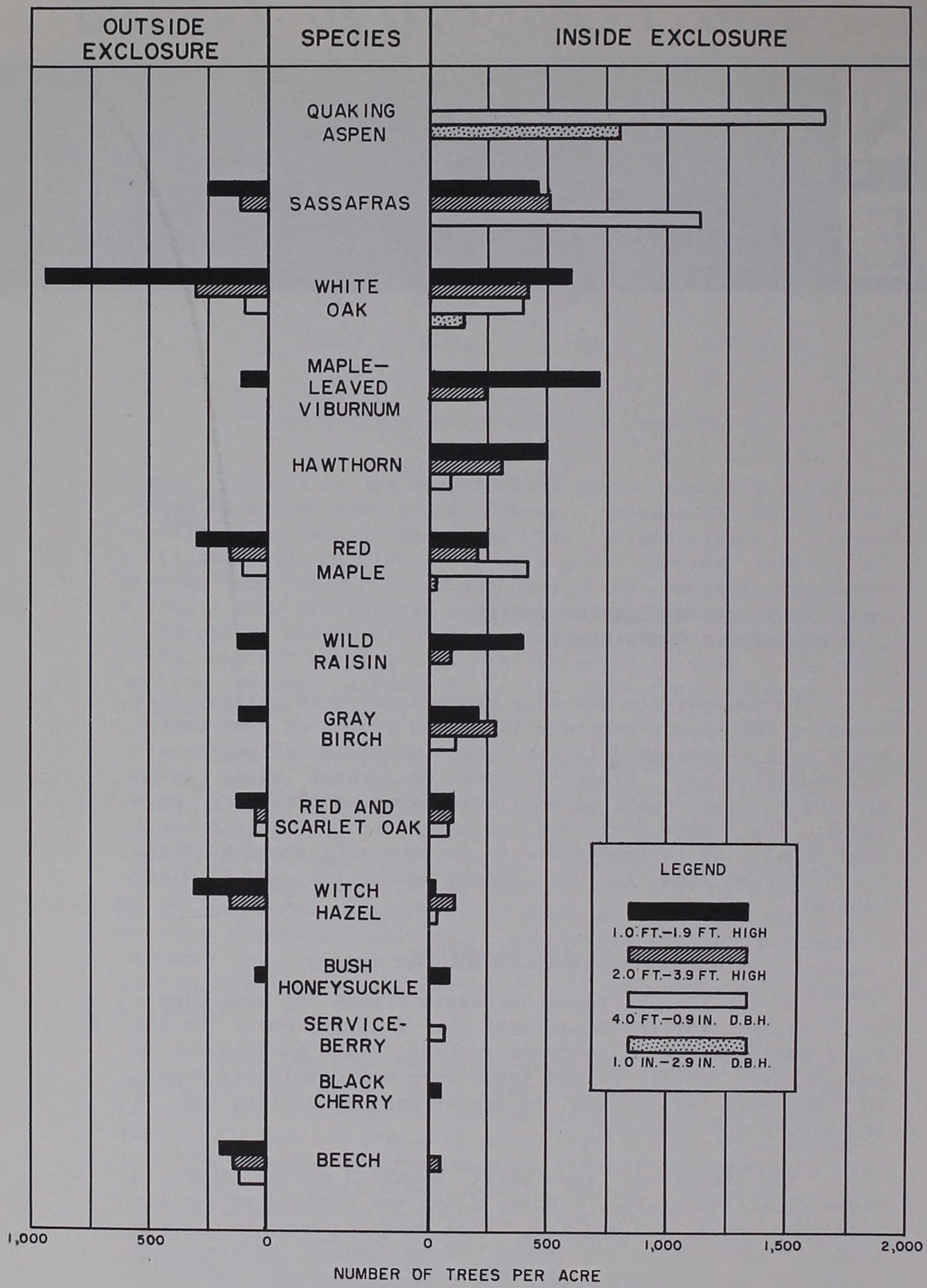


Figure 1.--*Number of seedlings per acre, by height or d.b.h. class, outside and inside exclosures.*

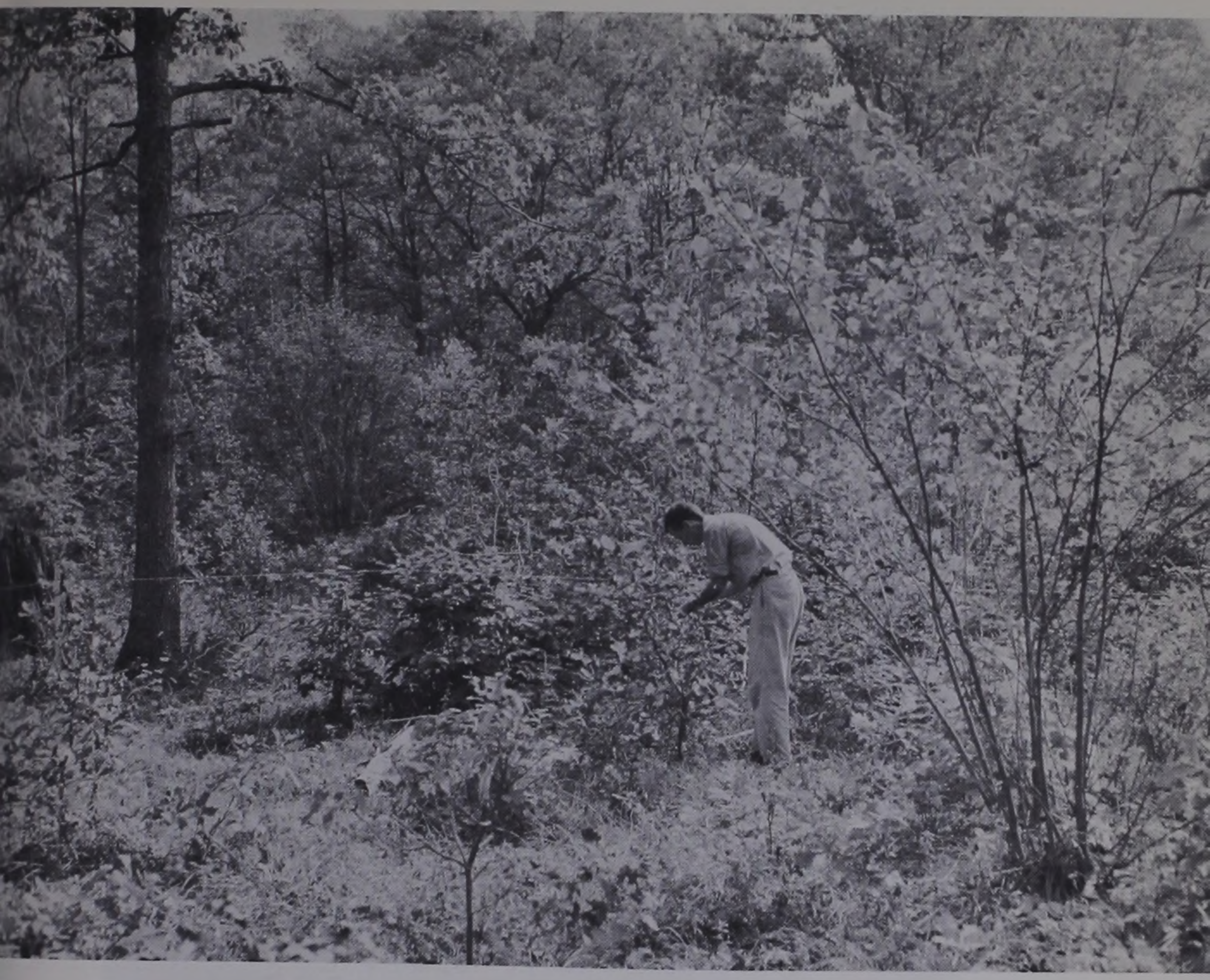

Figure 2.--*A check plot, showing form and growth of seedlings and sprouts.*

One of each fenced pair of plots originally was rabbit-proofed with fine wire netting, but the netting broke down or was disturbed by vandals, so the fenced plots can be considered as duplicates, excluding deer only.

## Results

After seven growing seasons (fall of 1959), developments at the two plot locations were similar, so the data are combined in the following summary of results:

- Seedlings generally were more numerous in the fenced plots than in the open check plots; this was particularly true of the size classes larger than 2 feet tall (fig. 1). The considerable numbers of 1- to 1.9-foot seedlings on the

Figure 3.--*Dense aspen reproduction inside an exclosure at the same location as check plot shown in Figure 2.*

check plots included many stems that had been browsed back but not killed--stems that otherwise would have grown into larger sizes.

Differences between fenced and check plots--that is, browsing effects--were most marked on aspen, sassafras, hawthorn, and the viburnums. Aspen was completely eliminated from the check plot in the one location where it occurred (fig. 2), whereas a dense stand developed where protected inside the fence (fig. 3). That this was a true treatment effect, and not explainable by a dearth of initial stocking of aspen on the check plot, was shown by interim tallies: 4,600 aspen stems per acre in 1954; down to 39 stems per acre in 1957; and none in 1959.

- Numbers of sprout clumps were not markedly affected by exposure to browsing, except, possibly, serviceberry and hawthorn. Evidently browse was plentiful enough locally, as a result of the 1953 cuttings, so that sprout clumps generally were able to survive.

- Although numbers of sprout clumps were little affected by browsing, average numbers of stems per clump, average heights, and average crown spreads were substantially reduced (fig. 4). Sprouts of the more desirable species, such as white oak and red maple, were almost twice as tall inside the exclosures as on the check plots.

- The growth form of both seedlings and sprouts outside the exclosures was generally shrubby and misshapen from repeated browsing (fig. 2), as compared to the normal, reasonably straight stems of the same species found inside the fences (fig. 3).

## Discussion

Because of the browse cutting in 1953 and subsequent sprouting, considerable deer food was available locally, and the destructive effects of deer on commercial timber species were not so striking as may sometimes be seen. Some stems gradually were getting above deer's reach and will form some sort of forest stand.

The elimination of aspen points up the effect that deer often have on beaver and other wildlife. Aspen is the most important food of beaver in the Northeast (Martin, et al., 1951).[1] And it has often been observed that, where beaver fell aspen in overpopulated deer ranges, suckers that

---

[1]Martin, Alexander C., Zim, Herbert S., and Nelson, Arnold L. American wildlife and plants. 500 pp., illus. New York, London. 1951.

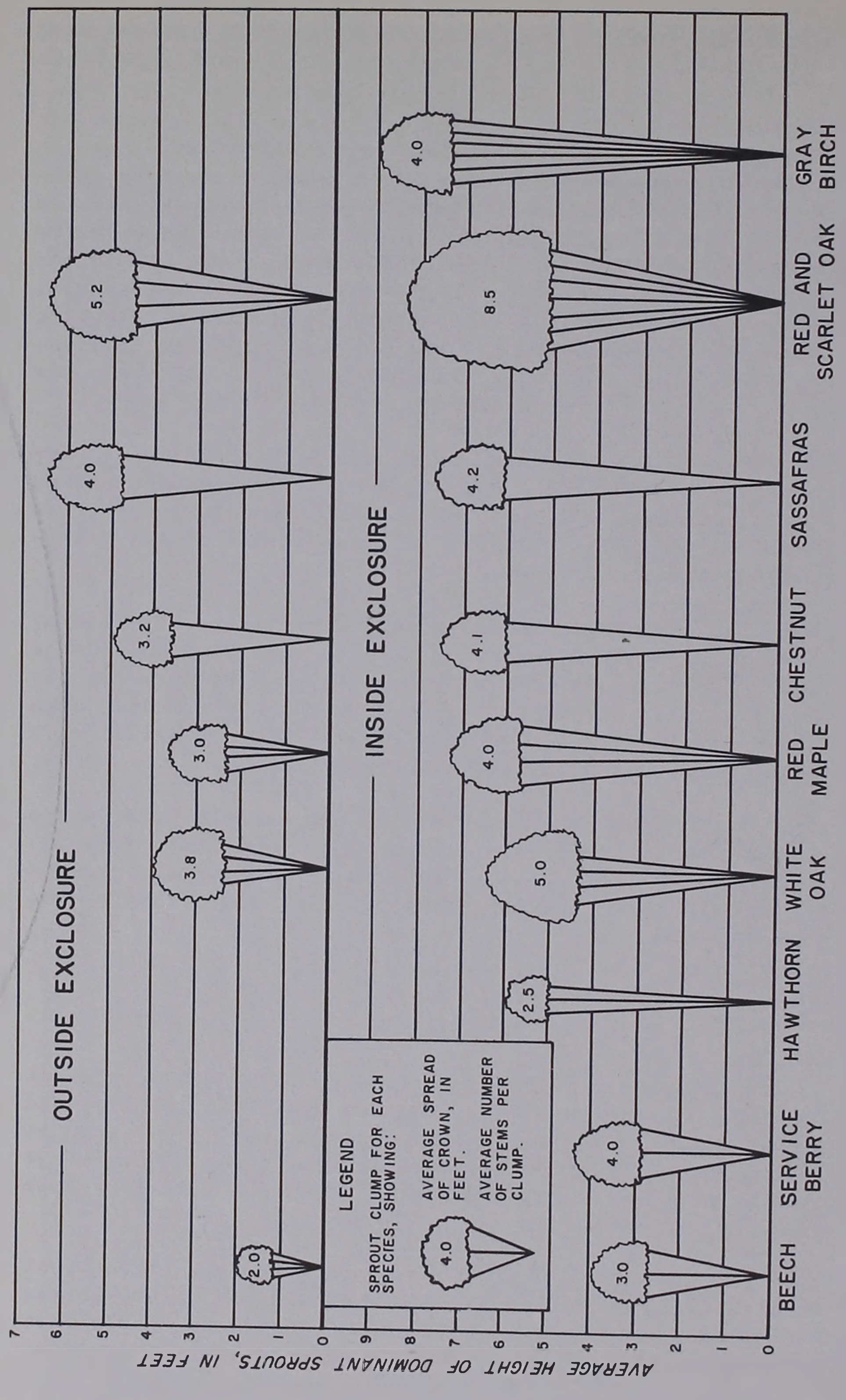


Figure 4.--*Average number of stems per sprout clump, their average height and average crown spread, by species, outside and inside the exclosures.*

would normally replace these felled trees are eliminated by deer browsing, and the beaver move out.

In a normal selective timber-cutting operation, excessive deer herds could be expected to have an even greater influence on reproduction than on our study areas because less browse would be produced. Even where browse is abundant and regeneration is able eventually to form a closed stand, a heavy deer population can strongly influence the quality and composition of the new forest with respect to both timber and wildlife habitat values.

--E. L. SHAFER, Jr., T. J. GRISEZ, and ED SOWA
Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture